Remarks

Claims 1 - 2, 4 - 9, 12 –15, 17 - 20, and 22 - 23 remain in the application.

The examiner states that the Rule 132 declaration filed 5 November 2010 is insufficient since it refers to the specification rather than to the claims. The declaration addresses the admissibility of amending the specification to correct the obvious error between valence and conduction bands. Once the specification has been amended, the claims reciting these bands are fully supported in the amended specification.

The examiner objects under 35 U.S.C. 132(a) to the amendment file 16 April 2010 because he alleges it introduces new matter. The examiner attempts to dismiss the expert declaration of Dr. Orita and Prof. Ohta by stating that they have misunderstood the textbook of Sheng S. Li on which they rely. First, Dr. Orita and Prof. Ohta were asserting the obviousness of the error in the specification of interchanged valence and conduction bands, not that valence and conduction bands need to have their reference levels specified similarly to the work function. Secondly, Dr. Orita and Prof. Ohta are the experts and believe their interpretation of Sheng S. Li is consistent with common understanding in the field. The examiner has not been proved to be an expert in the field and so he must defer to the interpretation of Dr. Orita and Prof. Ohta. The examiner now further relies on the newly cited Sze textbook. To any mechanic of ordinary skill, it is obvious that Sze, like the other references, are referencing the work function and all band energies (electron affinities) to the same reference level, which can be chosen to be vacuum level (zero energy), if the band energies and work function are being compared.

The examiner rejects claims 18-19 and 24 under 35 U.S.C. §112, ¶1 as not being supported in the specification at the time it was filed. Claims 18 and 19 are properly supported when the new matter rejection is removed. Claim 24 has been canceled.

The examiner rejects claims 18-19 and 24 under 35 U.S.C. §112, ¶2 as being indefinite. Claim 24 has been canceled. The examiner objects to claims 18 because the "energy level of the conduction band edge is only meaningful when a reference energy level, i.e. 0 energy level is

defined." First, the examiner's argument rebuts itself since the examiner seems to accept that 0 energy is the usual reference energy level. In quantizing a value, zero does not need to be stated to be a reference if it is the reference level. The attached recent technical article by Caballerfo-Briones et al, "Direction Observation of the Valence Band Edge by in Situ ECSM-ECTS in p-type Cu_2O Layers prepared by Copper anodization," *Journal of Physical Chemistry C*, vol. 11, no. 3, pp. 1028-1036 quantizes in FIGS. 7 and 9 different band levels with absolute energies, most apparently referenced to the same zero, vacuum level most often used for work functions. Accordingly, the ordinary mechanic recognizes that all parts of a complex band structure should be referenced to a common level and the vacuum level is a satisfactory reference level.

Secondly, a lack of a reference level does not render a value of one parameter meaningless if that value is being compared, as in the claims, to the value of another parameter in which the same reference level is used for both. The various energy band structure illustrated by both Li and Sze assume the same reference level for the entire structure. The examiner attempts to impose a formalism upon the technology of band structure calculation and measurements neither required nor terribly useful in the technology. If the band structure levels are to be differenced, it is known in the art that any reference level common to the two levels may be used without being specified.

The examiner rejects claims 1-2, 4-9, 12-1 (*sic*,15), 17-19, 22 and 24 being obvious over Kawazu et al. (US 5,539,239 A, hereafter Kawazu) in view of Shimizu et al. (US 2003/0063462 A1, hereafter Shimizu).

The examiner dismisses the difference in claims 1 and 13 between the claimed thickness range of 100nm to 10 microns and Kawazu's thickness of 10nm for his i-ZnSe active layer 4, which he states is "close enough" and "that one skilled in the art would have expected them to have the same properties" with reference to MPEP 2144.05 (I). As has been argued before, the examiner is stretching the decision of *Titanium Metals* cited in the MPEP far beyond its holding and indeed contrary to its holding. The claimed thickness range is at least ten times larger than Kawazu's thickness and certainly does not conform to the usual meaning of close enough and is

far greater than the difference of *Titanium Metals* described in the MPEP as 0.8% nickel versus 0.75% or 0.94% nickel or 0.3% molybdenum versus 0.25% or 0.31% molybdenum. All the *Titanium* differences are substantially less than a factor of two, not a factor of ten or more, as recited in claims 1 and 13.

Further, even according the MPEP, for *Titanium Metals* to apply, the ranges must be "close enough that one skilled in the art would have expected them to have the same properties." Any reasonable mechanic would recognize that Kawuzu's 10nm intrinsic active layer has significantly different properties than the claimed light-emitting layer having a thickness of at least 100nm. Kawazu's invention is directed to buffer layers outside of the cladding and does not describe his active layer much beyond a 10nm-thick ZnSe layer. However, he recognizes in the background section at col. 1, lines 32-33 that a 10nm-thick layer of a similar composition of CdZnSe forms a quantum well layer so that his 10nm-thick ZnSe active layer is expect to form a quantum well as well. Kawazu does not suggest that a layer significantly thicker than 10nm would work with his invention or that it would not form a quantum well, as apparently required for his invention. The present inventors at [0114] of US 2006/0261350 contrast their inventive device with a conventional pin-diode having an intrinsic layer of "a thickness of several nm to several tens of nm to spatially confine both the carriers to the i-layer." This description of the conventional structure conforms to Kawazu's quantum-well active layer of 10nm thickness. Therefore, according to uncontradicted evidence of record, the ordinary mechanic understands that an active layer of thickness of 100nm or more does not form a quantum well and operates significantly differently from Kawazu's 10nm quantum-well layer. Further, the factor of ten for the difference in thickness is beyond the range of routine experimentation and, as explained above, the difference produces a new and unexpected result of an effective light-emitting layer having a thickness greater than that of a quantum-well layer and thus a larger light-generating volume. Such a large difference satisfies the result-effective variable test of *In re Antonie*, 195 USPQ 6, 9 (CCPA 1977) and the new and unexpected result test of *In re Aller*, 105 USPQ 233, 235 (CCPA 1955). As a result, the claimed range of 100nm to 10 microns for the light-emitting film is not obvious over Kawazu's 10nm thickness for his active layer. If the ordinary mechanic

is attempting to replicate Kawazu's quantum-well layer, exemplified by a 10nm-thick active layer, he would not routinely experiment with 100nm-thick active layers, known to be far greater than quantum-barrier thicknesses.

Claims 1 and 13 also require that the light-emitting layer "is formed on a glass substrate." The examiner states that Shimizu teaches at [0069, 0143, and 0144] that the light-emitting layer is "formed on a glass substrate." The examiner misquotes and mischaracterizes Shimizu, who describes at [0143] "a heat dissipating substrate 73 on which the LED chips 72 are mounted." At [0144], the heat dissipating substrate 73 may be glass. A device is necessarily formed before it is mounted, as in Shimizu.

Shimizu describes in general terms for embodiment 6 the formation of the LED chip, which are disposed on the heat-dissipating substrate. In a process for manufacturing an LED chip is disclosed in [0150] – [0153], the LED chip is manufactured by depositing on a growth substrate 116 a p-type semiconductor layer, an n-type semiconductor layer, and an active layer, thereby forming an LED layer 111. Shimizu does not disc lose the material of the growth substrate 116, but it is likely monocrystalline. Shimizu then removes the LED layer 111 from the growth substrate 116 and bonds it to a mounting substrate 116', corresponding to the heat-dissipating substrate 73. Thus, Shimizu does not form his light-emitting layer on his substrate 73 or 116', but on his growth substrate 116 of undisclosed composition and unlikely to be glass in view of Shimizu's need for lattice matching and precision growth of quantum wells.

To avoid this plainly erroneous reading of Shimizu, claims 1 and 13 have been amended to require that the light-emitting layer is a film that is deposited on the glass substrate, as supported at [0157] of US 2006/0261350. A deposited film is structurally distinguishable from a mounted chip. Surely, Shimazu's chip, which must be free standing, is not a film and his chip mounting does conform to the now claimed depositing.

Since Kawazu intends his light-emitting layer to be epitaxially grown as a crystalline layer, the lattice constants of the substrate and the light-emitting layer are required to match and that the substrate must be crystalline. A glass substrate does not supply the crystallinity nor lattice matching for Shimizu's LED chip or Kawazu's ZnSe photodiode. The present invention

allows the use of glass as a substrate because a light-emitting layer being ambipolar allows the use of a growth substrate which may be amorphous or polycrystalline.

Yet further, Shimizu uses a glass epoxy substrate as the mounting substrate, not the claimed glass substrate.

For the substantive rejection of claim 18, the examiner alleges Kawazu intrinsically (*sic* inherently) has the claimed relationships of conduction and valence bands and work functions because his "active layer is exactly the same as the examples." This conclusion should be removed. As argued before, Kawazu's active layer of 10nm thickness operating as a quantum well differs in fundamental ways from the structure described by the inventors at [0157] having a ZnSe film of 1 micron thickness and inherently not operating as quantum well. Further, the claimed thickness of 100nm to 10 microns for the light emitting film is not close enough so as to be obvious over the 10nm thickness of Kawazu, as has been argued above. The examiner is requested to provide technical justification known in the prior art for the equivalency of 10nm-thick and 100-nm thick light emitting ZnSe films.

The Commissioner is authorized to charge Deposit Account 50-0636 any required fees including extension fees and extra-claim fees.

Applicants' attorney is eager to discuss with the examiner ways to obtain allowable claims of reason scope including restricting the number of claim sets.

In view of the above amendments and remarks, reconsideration and allowance of all claims are respectfully requested. If the Examiner believes that a telephone interview would be helpful, he is invited to contact the undersigned attorney at the listed telephone number, which is on California time.

Respectfully submitted,

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